

Agriculture

Ck12 Science

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CONCEPT 1

Agriculture

- Describe ways chemistry has contributed to the success of modern agriculture.



In the spring, many people begin to plant their gardens. They see ads in catalogs or shop the gardening section of a local store to get ideas. The right place in the garden is selected, seeds or plants are put in the soil, and then the wait. Whether it is a small home garden or a large thousand acre farm, chemistry contributes greatly to the success of the crop.

Agriculture

Crops need three things for good growth: water, **nutrients** from the soil, and protection from predators such as insects. Chemistry has made major contributions in all three areas. Water purification uses a number of chemical and physical techniques to remove salts and contaminants that would pollute the soil. Chemical analysis of soil allows the grower to see what nutrients are lacking so they can be added. In the spring, grocery stores, hardware stores, and gardening centers have high stacks of bags containing fertilizers and weed killers that enrich the soil and keep down unwanted plants. These same stores also provide a number of sprays or solid treatments for insects that might otherwise have a snack on the plants.

Water Purification

Fresh water is essential for good crops. In some areas of the world, there is enough rain to accomplish this task. In other locales, water must be provided so the crops will grow. Worldwide, irrigation covers about 18% of farm land and produces some 40% of crops. A major source of cleaner water in many parts of the world is provided by the process of **desalinization**.

Sea water is treated to remove salts and the resulting water can then be used for irrigation without contaminating the soil with materials that harm the growing plants.

**FIGURE 1.1**

Idaho wheat field.

**FIGURE 1.2**

Desalinization equipment.

Soil Nutrients

In many areas of the world, the soil is deficient in essential nutrients. A number of minerals such as phosphorus, potassium, calcium, and magnesium may not be present in large enough amounts to cause good plant growth. Nitrogen is extremely important for good crops.

Soil analysis is available from a variety of labs. Local university extension services can provide valuable information as to the composition of a soil and will also make suggestions as to the types and amounts of needed nutrients. Fertilizers can be purchased and added to the soil to enrich it and ensure better yield of crops.

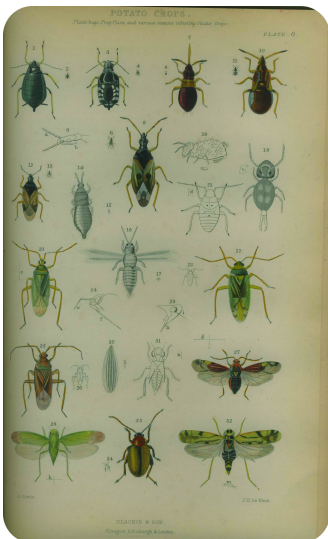
Insect Control

Even if the crop grows well, there is still the real possibility of insect or pest damage. The insect/pest can consume the crop or can damage it to the point where it will not grow well. Infestations of armyworms can do major damage to corn and grain crops. Aphids and boll weevils are major predators of cotton crops. Failure to control these pests

**FIGURE 1.3**

Man spreading chemicals on soil.

will result in widespread crop damage and financial loss to the farmer.

**FIGURE 1.4**

Potato pests.

Watch an armyworm video at <http://www.youtube.com/watch?v=b1SIOWeMkNQ> (3:39).

**MEDIA**

Click image to the left for more content.

A wide variety of **pesticides** have been developed by chemists and other scientists to deal with all these pests. The basic approach is to have the pesticide interfere with some biochemical process in the pest. Ideally, the pesticide will not affect other living organisms, but this is not always the case. It is very important to read the labels and observe all precautions when using pesticides.

Summary

- Plant nutrients are very important for good plant growth.
- Chemical analysis of soil can tell the farmer or gardener what nutrients are needed.
- Chemists have developed many pesticides that will kill plant predators such as the army worm and the boll weevil.

Practice

Use this resource <http://www.ncagr.gov/cyber/kidswrld/plant/nutrient.htm> to answer the following questions:

1. What is a macronutrient?
2. What is a micronutrient?
3. List two examples of each kind of nutrient
4. What does each one of these nutrients do for the plant?

Review

1. List three things crops need for good growth.
 2. How much of the water used in farming is provided by irrigation?
 3. What fraction of crops are grown using irrigation?
 4. Why do nutrients need to be added to the soil?
 5. How do pesticides work?
- **desalinization:** A major source of cleaner water in many parts of the world is provided by this process.
 - **nutrient:** Vitamins and Minerals that enable an organism to grow.
 - **pesticide:** Chemicals that will kill plant predators. Developed to preserve plant growth, without the interference of plant predators.